New method for creating bone tissue and cartilage tissue

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UT-Doctoral Degree Candidate Anne Leferink has discovered a new method for creating bone tissue and cartilage tissue. By sequencing structures, it is possible to create a larger piece of bone tissue or cartilage tissue than was possible with current techniques. The aim is to create as much bone as possible using as few stem cells as possible. The technique has to be injectable, so that complex bone defects such as osteoporosis

or arthritis can be treated without surgery. Leferink: "I haven't made any bone yet, but we do expect it to work."

Leferink is studying the applicability of various clinical imaging procedures in order to visualize the growth of cultured bone. She cultured tissue herself in order to visualize the process. While doing this she discovered a new method for creating bone tissue and cartilage tissue . The method works by combining small blocks, microstructures, with stem cells. The stem cells encapsulate the blocks in epoxy resin or polylactic acid. This results in small particles of bone-like material, that eventually join up with one another. This results in strong tissue that is much larger than is possible with current techniques.

During the next two years Leferink will start working as a postgraduate in order to test the technique together with researchers of the University of Maastricht. She wants to use this method to treat complex bone defects in difficult locations such as osteoporosis. The technique can also be used for arthritis, for creating new cartilage when it has shifted. "We want to achieve this by making the small blocks injectable. The treatment of for instance a cartilage defect, such as meniscus, is currently operative. A doctor has to find a way of getting to the damaged location." Leferink wants to inject the small blocks in a gel, so that bone or cartilage starts growing around the blocks. "Tissue grows very slowly or not at all at the edges of a defect in bone or cartilage. The small blocks, however, provide the cells with an anchor point, and recovery is more rapid." A technique does already exist that involves injecting gel in an attempt to heal damaged bone or cartilage, and it works. Leferink: "But that technique is not mechanically stable, the gel can move once pressure is exerted. This is why you are not allowed to use the body part during convalescence. Even though using the body part is particularly important in order to make it strong. If all goes well, the body part will be mechanically stable with our technique."

Anne Leferink will obtain her doctoral degree on 3 July with the Tissue Regeneration department of the MIRA research institute. Her study results have been published in the renowned scientific physics journal *Advanced Materials*. Her thesis supervisor is prof. dr. Clemens van Blitterswijk.

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